श्री माता वैष्णो देवी विश्वविद्यालय

विज्ञानं ब्रह्म

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

SCHOOL OF ELECTRICAL ENGINEERING

B. Tech. (EE – 3rd Sem.) **Minor Examination** (Odd Sem.), 2019-20

Entry No: | 1 | 8 | B | E | E | 0 | 2 | 1 |

Date:

Total Number of Pages: 01

Total Number of Questions: 03

Time: 1.5 Hours

Course Title: Electrical Measurement and Instrumentation

Course Code: EEL 2311

MM: 30

Instructions:

i. *All questions are compulsory.*
ii. ***Question 3 has a choice.***
iii. *Assume any data if required and support your answer with neat freehand sketches/diagrams, wherever appropriate.*
iv. *Sharing of calculator and stationery items is not permitted.*

Q. 1. A) Explain the different torques in analog meters and methods to provide damping torque. *(2)* CO1

B) Explain and drive the expression of different torques in Permanent Magnet Moving Coil Instrument. *(2)* CO1

C) Drive the expression of ammeter limit enhancement and explain the effect of temperature on ammeter. *(3)* CO1

D) A 0-25 A ammeter has a guaranteed accuracy of 1 percent of full-scale reading. The current measured by this instrument is 10 A. Determine the limiting error in percentage. *(3)* CO1

Q. 2. A) Explain the Murray-loop test with its expression. *(2)* CO2

B) Drive the bridge balance condition of Hay's Bridge. *(3)* CO2

C) The four arms of a bridge are connected as follows: *(5)* CO2

Arm AB: A capacitor C_1 with an equivalent series resistance r_1

Arm BC: A noninductive resistance R_3

Arm CD: A noninductive resistance R_4

Arm DA: A capacitor C_2 with an equivalent series resistance r_2 in series with a resistance R_2

A supply of 500 Hz is given between terminals A and C and the detector is connected between nodes B and D. At balance, $R_2 = 5\ \Omega$, $R_3 = 1000\ \Omega$, $R_4 = 3000\ \Omega$, $C_2 = 0.3\ \mu F$ and $r_2 = 0.25\ \Omega$. Calculate the values of C_1 and r_1, and also dissipation factor of the capacitor.

Q. 3. *Attempt any two*

A) Explain the Potential Transformer with its equivalent and phasor diagram. *(5)* CO3

B) A ring core type CT has a ratio of 2000/10. When operating at rated primary current with a secondary burden of noninductive resistance value of 2 Ω, takes a no-load current of 2 A at power factor of 0.3. Calculate (i) the phase angle difference between primary and secondary currents, and (ii) the ratio error at full load. *(5)* CO3

C) A potential transformer with nominal ratio 1100/110 V has the following parameters: Primary resistance = 82 Ω, Secondary resistance = 0.9 Ω, Primary reactance = 76 Ω, Secondary reactance = 0.72 Ω, No load current = 0.02 A at 0.4 power factor. *(5)* CO3

Calculate (i) phase angle error at no load

(ii) burden in VA at unity power factor at which phase angle error will be zero.

CO	Course Outcomes	Question Mapping	Total Marks	Total Number of Students (to be appeared in Exam)
CO1	To introduce the basic principles of all measuring instruments.	1	10	35
CO2	Measurement of R, L and C using different measuring instruments and understand their operation and characteristics.	2	10	
CO3	Identify and effective use of potentiometer and instrument transformers.	3	10	
		TOTAL	30	

विज्ञानं ब्रह्म

श्री माता वैष्णो देवी विश्वविद्यालय

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

SCHOOL OF ELECTRICAL ENGINEERING

B. Tech. (EE – 3rd Sem.) **Major Examination** (Odd Sem.), 2019-20

Entry No: | 1 | 8 | B | E | E | 0 | 2 | 1 |

Date:

Total Number of Pages: 02

Total Number of Questions: 05

Time: 3 Hours

Course Title: Electrical Measurement and Instrumentation
Course Code: EEL 2311

MM: 50

Instructions:

i. *All questions are compulsory.*
ii. *Do not write any thing on question paper except entry no. and date.*
iii. ***Question 2 and 4 has choice.***
iv. *Assume any data if required and support your answer with neat freehand sketches/ diagrams, wherever appropriate.*
v. *Sharing of calculator and stationery items is not permitted.*

Q. 1. *Attempt all parts*

A) Describe the different methods of measurement. (2) CO1

B) Drive the expression of torque in Moving Iron type instruments. Also derive the condition of equilibrium. (4) CO1

C) A moving-coil voltmeter has a resistance of 100 Ω. The scale is divided into 150 equal divisions. When a potential difference of 1 V is applied to the terminals of the voltmeter a deflection of 100 divisions is obtained. Explain how the instrument could be used for measuring up to 300 V. (4) CO1

Q. 2. *Attempt any two parts*

A) Write down the different methods for measurement of low resistance. Explain and drive the expression of Kelvin's bridge. (5) CO2

B) Write down the name of bridges suitable for low, medium and high quality (Q) factor. Explain the method for High Q coils in details. (5) CO2

C) The four arms of a bridge supplied from a sinusoidal source are configured as follows: (5) CO2

Arm AB: A resistance of 100 Ω in parallel with a capacitance of 0.5 μF

Arm BC: A 200 Ω noninductive resistance

Arm CD: A 800 Ω noninductive resistance

Arm DA: A resistance Rx in series with a 1 μF capacitance

Determine the value of Rx and the frequency at which the bridge will balance. Supply is given between terminals A and C and the detector is connected between nodes B and D.

Q. 3. *Attempt all parts*

A) Write down the application of DC Potentiometer. Explain the principle of measurement of high voltage by potentiometer in detail. (5) CO3

B) Explain the principle of current transformer with its equivalent and phasor diagram. Also derived the expression for phase angle error. (5) CO3

Q. 4. *Attempt any two parts*

A) Two incandescent lamps with 80 Ω and 120 Ω resistances are connected in series with a 200 V dc source. Find the errors in measurement of power in the 80 Ω lamp using a voltmeter with internal resistance of 100 kΩ and an ammeter with internal resistance of 0.1 mΩ, when (5) CO4

(a) the voltmeter is connected nearer to the lamp than the ammeter, and

(b) when the ammeter is connected nearer to the lamp than the voltmeter

B) Explain the working principle of Cathode Ray Tube with its controls. Also draw the detailed wave form of two signals Vx and Vy as given below, when applied to vertical and horizontal axis of CRO. (5) CO4

$$V_x = V_m Sin(\omega t)$$
$$V_y = V_m Cos(\omega t)$$

C) Explain the construction, operating and breaking principle of energy meter. (5) CO4

Q. 5 *Attempt all parts*

A) Explain the working principle of Multimeter. (2) CO5

B) Name the different temperature transducer. Explain the thermocouple in detail. (4) CO5

C) Explain the working of linear variable differential transformer. (4) CO5

CO	Course Outcomes	Question Mapping	Total Marks	Total Number of Students (to be appeared in Exam)
CO1	To introduce the basic principles of all measuring instruments.	1	10	35
CO2	Measurement of R, L and C using different measuring instruments and understand their operation and characteristics.	2	10	
CO3	Identify and effective use of potentiometer and instrument transformers.	3	10	
CO4	Understand the different types of electrical and electronics measuring instruments.	4	10	
CO5	Understand the basic concepts of smart and digital metering and measurement of other entities.	5	10	
		TOTAL	50	